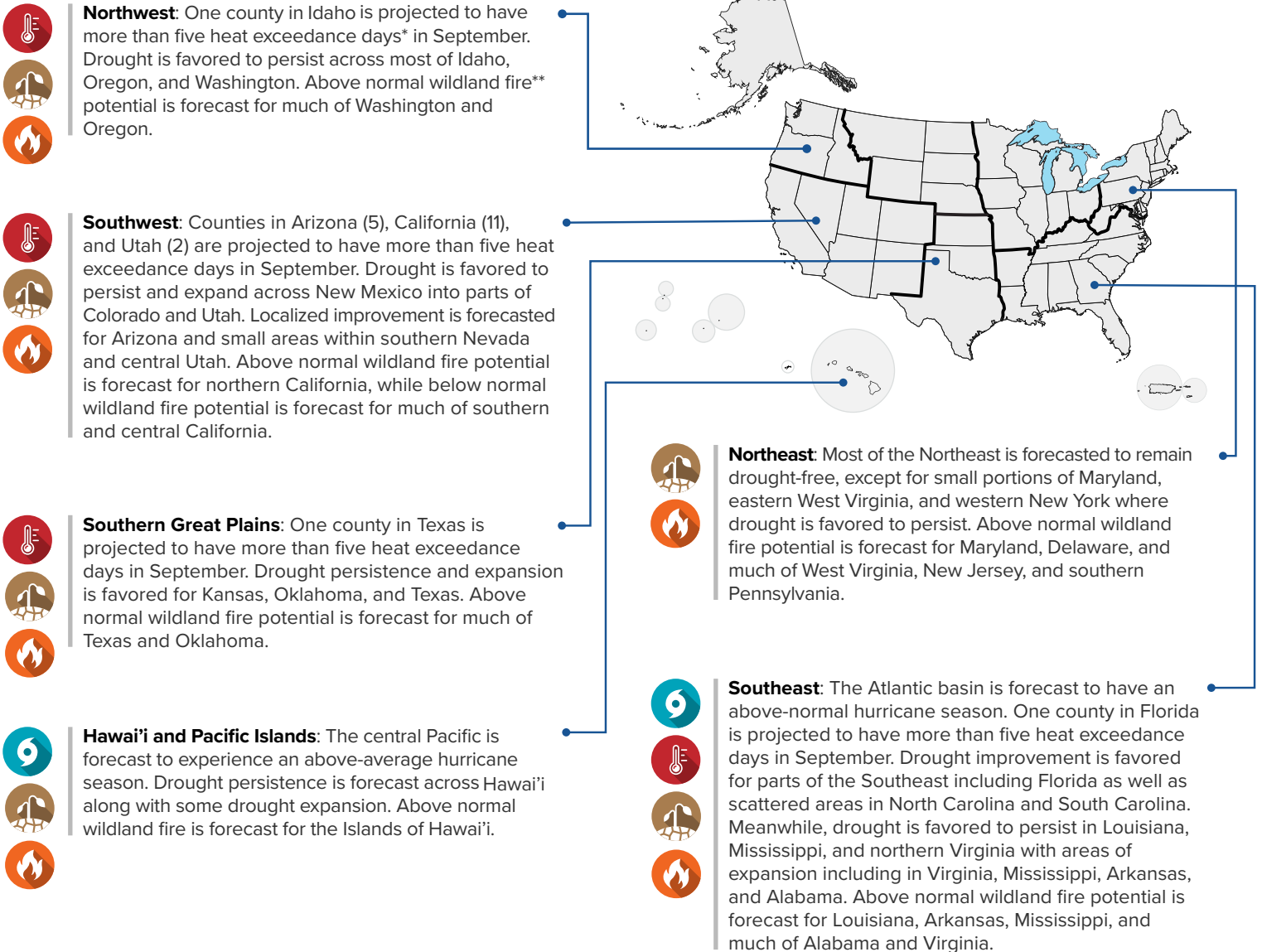


Climate and Health Outlook

ISSUED SEPTEMBER 2023

The Climate and Health Outlook is an effort to inform health professionals and the public on how our health may be affected in the coming months by climate events and to provide resources for proactive action. An [associated webpage](#) includes additional resources and information.



Drought Wildfire Hurricane Heat

*A "heat exceedance day" is when the daily maximum temperature is above the 95th percentile value of the historical temperature distribution in that county.

**Smoke from wildfires can impact health hundreds of miles from site of the fire.

Developed with data from the Centers for Disease Control and Prevention, the National Oceanic and Atmospheric Administration, and the National Interagency Fire Center.

Where are extremely hot days expected in September?

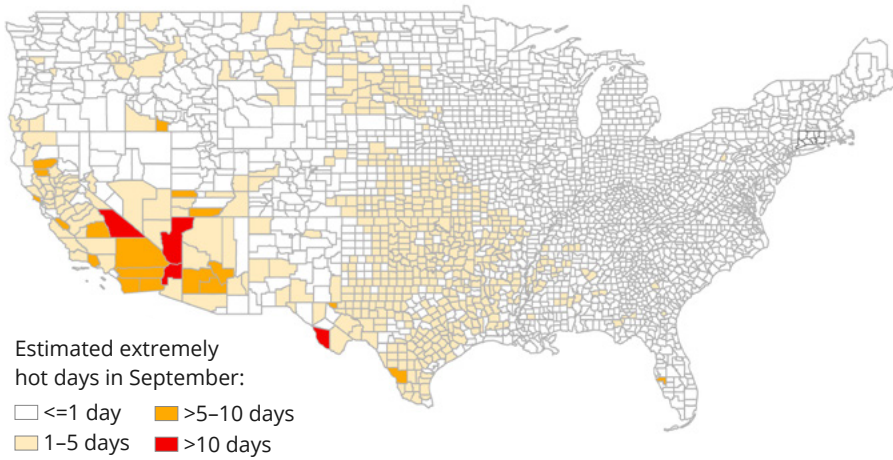


Figure: This map shows the expected number of extremely hot days in September in each county in the contiguous United States. The forecast is based on the NOAA Climate Prediction Center’s probabilistic outlook of temperatures being above, below, or near normal in September. A county’s ‘normal’ temperature is based on the 30-year average from 1991–2020. An ‘extremely hot day’ is when the daily maximum temperature is above the 95th percentile value of the historical temperature distribution in that county. For more information on your county, please refer to the [Centers for Disease Control and Prevention \(CDC\) Heat and Health Tracker](#).

In September, **23** counties across **6** states are estimated to have more than five expected extremely hot days. In these counties, the total population at risk is **15,816,267** people. Climate projections indicate that extreme heat events will be more frequent and intense in coming decades. In the U.S., an average of 702 heat-related deaths occur each year.

Who is at high risk from heat in the counties with the most extreme heat days?

Some communities face greater health risks from extreme heat given various risk factors they face. These communities include people who: are elderly and live alone, have existing health conditions, have poor access to healthcare, live in rural areas, have disabilities, work outdoors, make a low income, face difficulty paying utility bills, live in poor quality housing, and live in urban areas without adequate tree cover.

California Department of Public Health’s Findings from the 2022 Labor Day Heat Wave

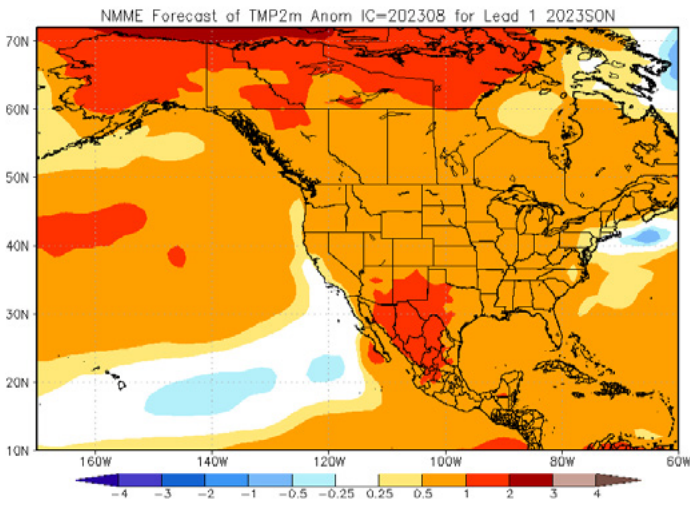
From August 31 through September 9, 2022, a record-breaking heat wave occurred across California. Temperature records were set in approximately 1,500 locales and excessive heat warnings were issued for much of the state. During this 10-day heat wave, an [analysis by the California Department of Public Health \(CDPH\)](#) found a 5% increase in deaths in the state – **395 more deaths** than would be expected. The **highest increases in deaths were seen among people aged 25-64, people who identify as Hispanic or Latino, and people from the South Coast region, including Los Angeles and neighboring counties.** While we know from previous analyses that older adults and the very young are vulnerable to negative health impacts from extreme heat, CDPH notes that **it is important for heat interventions to also consider the vulnerability of working-age adults, who may work in hot conditions or have other types of over-exposure to heat.** CDPH believes the finding for the South Coast region may reflect where fewer residences have air conditioning, and where people are less acclimated to heat than inland residents.

This analysis highlights that we can likely expect heat impacts to extend into September in coming years. **California has invested \$404 million towards addressing extreme heat impacts, guided by the state’s [Extreme Heat Action Plan](#).** CDPH hopes that these findings will help guide future public health prevention, response, and resilience efforts as this plan is implemented.

Some medications increase the risk of heat-related illness. These include diuretic medicines (sometimes called “water pills”), antihistamine medicines (including many allergy medicines), and many antipsychotic medicines used to treat a variety of psychiatric and neurologic illnesses. Check out SAMHSA’s [Tips for People Who Take Medication: Coping with Hot Weather](#) for more information.



How hot will it be, and where, over the next 3 months?



For September–November, the North American Multi-Model Ensemble (NMME) predicts that the average temperature will be 0.45 to 3.6°F (0.25 to 2°C) above normal for most of the continental United States, with the Southwest experiencing the highest 90-day average and the Northeast experiencing the lowest. The NMME integrates multiple forecasts of the next 90 days to build the best estimate of temperatures and precipitation over that time frame. Note that although many regions across the continental United States may expect a warmer 90-day average temperature, this is not the same as your local weather forecast, in which large fluctuations in temperature may be predicted from day to day.

Figure: The North American Multi-Model Ensemble’s (NMME) forecast for temperature in September–November 2023 compared to climatological average (from 1991–2020) based on combining forecast information from state-of-the-art computer climate models currently running in the U.S. and Canada, including from the National Aeronautics and Space Administration (NASA), two groups from the National Oceanic and Atmospheric Administration (NOAA), and from the National Center for Atmospheric Research (NCAR). For more information about this model or prediction, please refer to the [NMME website](#).

EMS HeatTracker

OCCHE and the National Highway Traffic Safety Administration (NHTSA) have launched a new resource called the [Heat-Related EMS Activation Surveillance Dashboard](#), or the “EMS HeatTracker” for short. This first-of-its-kind tool maps EMS responses to heat-related illness across the country to help local decision makers and communities prioritize resources and interventions to prevent heat-related illness and save lives.

The EMS HeatTracker highlights jurisdictions (including all 50 U.S. States, Puerto Rico, and D.C.) and counties with the highest rates of heat-related EMS activations and allows for county- and jurisdiction-level comparisons to national averages in three categories in the prior rolling 30- and 14-day periods:

- population rate of heat-related EMS activations within a community;
- average EMS time in transit to reach a patient; and
- the percent of patients who are transported to a medical facility for further treatment.

The tool also provides national-level information on the

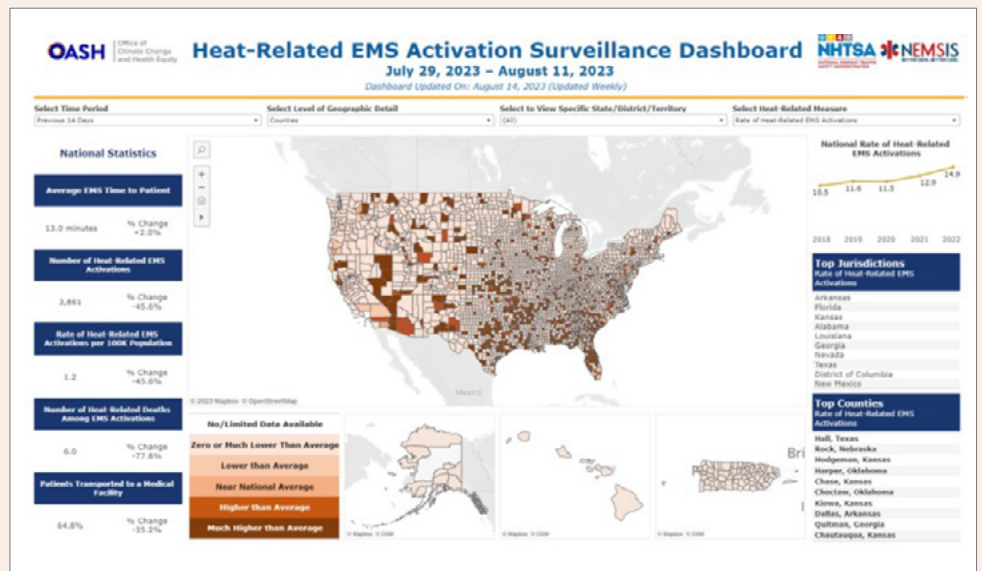


Figure: Image of the EMS HeatTracker showing county-level rates of heat-related EMS activations from July 29, 2023 – August 11, 2023.

number of heat-related EMS activations and the number of heat-related deaths among patients who were alive when EMS officials arrived on the scene. Demographic information is also available at the national level, including the age, race, gender, and urbanicity (i.e., urban, suburban, rural, and frontier) of patients.

The information displayed on the EMS HeatTracker is updated every Monday morning with a two-week lag behind real time.

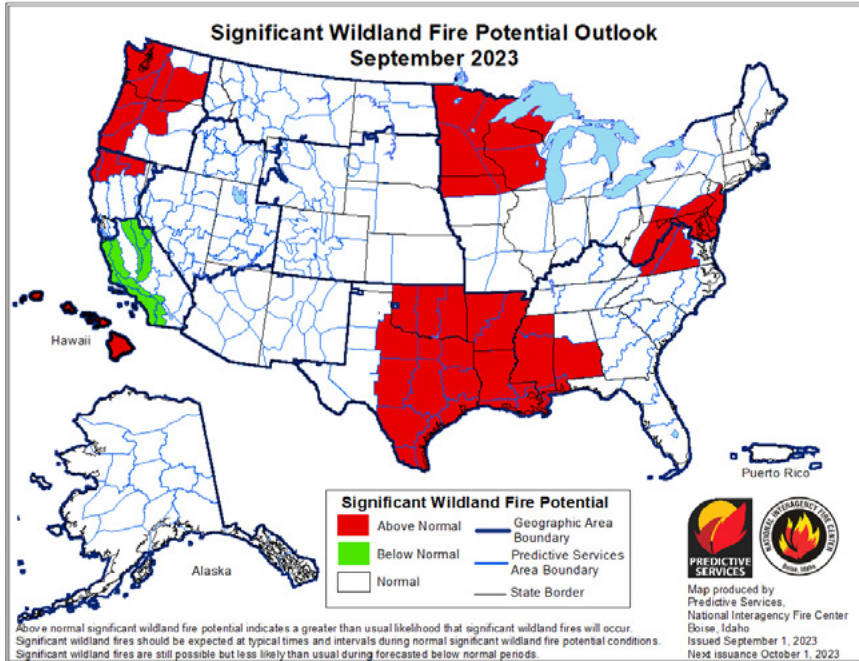


Figure: The [National Significant Wildland Fire Potential Outlook](#) identifies areas with above, below, and near normal significant fire potential using the most recent weather, climate, and fuels data available. These outlooks are designed to inform decision makers for proactive wildland fire management.

Significant fire activity continued to increase through August. In September, above normal significant fire potential is expected across the portions of the Northwest and northern California. Above normal potential is forecast across Hawai'i, especially on the Western sides of each island facing away from prevailing winds, due to long-term drought and periods of enhanced trade winds. Above normal potential is forecast across the Upper Midwest in September due to long-term drought as well as forecasted hot and dry conditions, further drying fuels. Much of the Southern Area from Oklahoma and central Texas eastward through the Lower Mississippi Valley into southern Alabama will have above normal significant fire potential in September. Above normal potential is also forecast for portions of the Mid-Atlantic, Virginia, and West Virginia in September due to long term dryness and the potential for early leaf drop due to drought-stressed hardwoods. Below normal significant fire potential is forecast for much of southern and central California in September.

Asthma-Associated Emergency Department Visits Increased During Canadian Wildfires

During 2023, wildfire smoke traveled hundreds of miles and affected air quality in communities across the country. In a new [Morbidity and Mortality Weekly Report](#), investigators at CDC and EPA analyzed data from April 30 through August 4, 2023, to assess the extent to which smoke from the wildfires in Canada resulted in asthma-associated emergency department (ED) visits in the United States. Overall, ED visits for asthma were **17% higher than expected during 19 days of wildfire smoke**. Higher-than-expected asthma-associated ED visits were observed among people of all ages, but the highest increase was among people 5–64 years-old. **The largest increase** in asthma-associated ED visits occurred in HHS [Region 2](#), which includes New York and New Jersey. The observed increase in asthma ED visits highlights the need to reduce smoke exposure during wildfires and can help guide emergency response planning and public health communication strategies, especially in U.S. regions where wildfire smoke was previously uncommon. The findings suggest that clinicians can consider counseling patients about protective measures, including awareness of current and predicted air quality conditions, staying indoors, using air filtration, and using properly fitted N95 respirators when outdoors. These measures are especially important for people with asthma, chronic obstructive pulmonary disease, and for children, older adults, and pregnant people.

Resources to Reduce Health Risks Associated with Wildfires

The [Ready.gov Wildfires site](#), [Centers for Disease Control and Prevention \(CDC\) Wildfires site](#), and Environmental Protection Agency (EPA) [Smoke-Ready Toolbox for Wildfires](#) include information about how to prepare for wildfires, stay safe during a fire, and return home after a fire.

The [AirNow Fire and Smoke Map](#), a joint project of EPA and the U.S. Forest Service, provides information on fire locations, smoke plumes, and air quality, using the color-coding of the Air Quality Index (AQI), along with recommended actions to take to reduce smoke exposure. The [AirNow Wildfires site](#) provides additional information on steps to protect your health. The Map is also available in the [AirNow app](#).

U.S. Monthly Drought Outlook
Drought Tendency During the Valid Period

Valid for September 2023
Released August 31, 2023

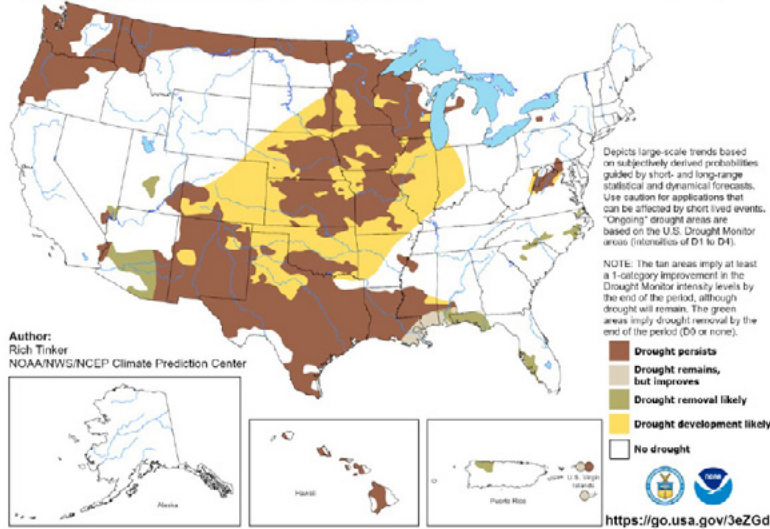


Figure: The National Weather Service Climate Prediction Center's Monthly Drought Outlook is issued at the end of each calendar month and is valid for the upcoming month. The outlook predicts whether drought will persist, develop, improve, or be removed over the next 30 days or so. For more information, please refer to drought.gov.

During September, drought improvement is favored for parts of the Southwest and Southeast along with drought areas of Puerto Rico and the western Virgin Islands. In contrast, drought persistence or intensification is forecast for a vast majority of the drought areas affecting the contiguous US and Hawaii. A broad expansion of drought conditions is forecasted by the end of the month, with some degree of drought anticipated to cover a large swath from the Southern Great Plains northward into portions of the Northern Great Plains and Midwest. Drought persistence is also forecast across the Northwest, eastern Virgin Islands, and Hawaii with a forecasted expansion in northern Virginia into western Maryland. Drought can have direct and indirect impacts on health—increasing incidence of illness among those living in the affected area and worsening mental health outcomes as livelihoods are challenged.

Who is at high risk in the counties projected to have drought in September?


As indicated in the map to the left, **1583 counties** across **34 states** are projected to have persistent/remaining drought or drought development in September. In these counties, the total population at risk is **120,474,745 people** and, of those, **1,288,848 people** work in agriculture. Of these counties:


- 462 (29%)** have a high number* of people aged 65 or over, living alone.
- 444 (28%)** have a high number of people living in rural areas.
- 352 (22%)** have a high number of people living in poverty.
- 325 (21%)** have a high number of people with frequent mental distress.
- 233 (15%)** have a higher number of adults with asthma.
- 469 (30%)** have a high number of people without health insurance.
- 538 (34%)** have a high number of uninsured children.
- 234 (15%)** have a high number of Black or African American persons.
- 252 (16%)** have a high number of people with severe housing cost burden.
- 292 (18%)** have a high number of people in mobile homes.
- 362 (23%)** have a high number of people with one or more disabilities.
- 359 (23%)** are identified as highly vulnerable by CDC's Social Vulnerability Index.


*"A high number" indicates that these counties are in the top quartile for this indicator compared to other counties.


Drought Affects Health in Many Ways


Drought increases the risk for a diverse range of health outcomes. For example:


 Low crop yields can result in rising food prices and shortages, potentially leading to **malnutrition**.

 Dry soil can increase the number of particulates such as **dust and pollen** that are suspended in the air, which can irritate the bronchial passages and lungs.

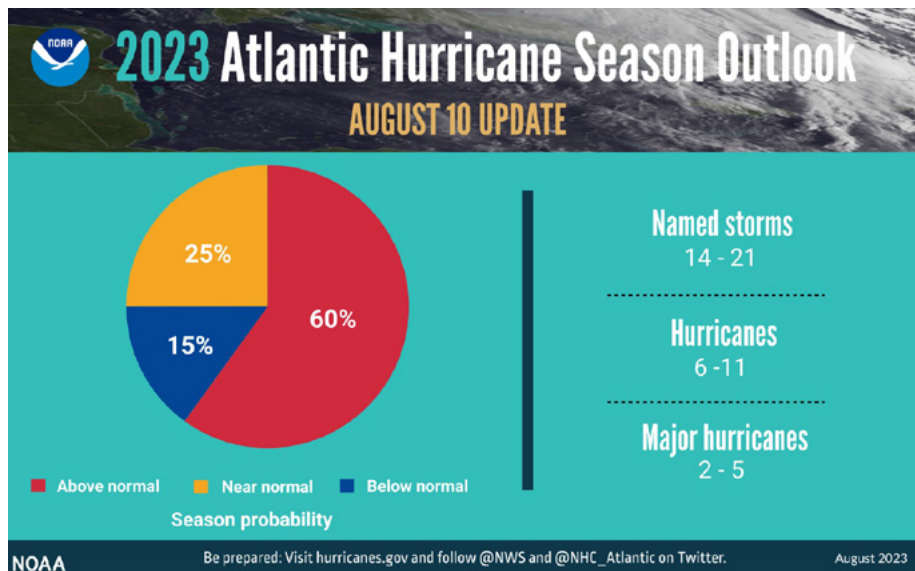
 Dust storms can spread the fungus that causes coccidioidomycosis (**Valley Fever**).

 If there isn't enough water to flow, waterways may become stagnant breeding grounds for **disease vectors** such as mosquitoes as well as viruses and bacteria.

 Drought's complex economic consequences can increase **mood disorders, domestic violence, and suicide**.

 Long-term droughts can cause **poor-quality drinking water** and leave inadequate water for hygiene and sanitation.

Outlook for the 2023 Hurricane season



The National Oceanic and Atmospheric Administration (NOAA) has increased the likelihood of an above-normal Atlantic hurricane season for 2023 to 60% (increased from the Outlook issued in May, which predicted a 30% chance). During the six-month hurricane season, which began June 1 and ends on November 30, NOAA is now forecasting a range of 14–21 named storms sustained with winds of 39 mph or higher, with 6–11 of those becoming hurricanes (winds of 74 mph or higher), and 2–5 becoming major hurricanes (winds of 111 mph or higher). Please note that these updated ranges include storms that have already formed this season. The 30-year averages for the Atlantic basin (1991–2020) are 14 named storms, 7 hurricanes, and 3 major hurricanes. The central Pacific, which includes Hawaii, is also forecasted to have an above-normal season this year, with a forecasted range of 4–7 tropical cyclones. Tropical cyclones include tropical depressions, tropical storms, and hurricanes. On average, the central Pacific experiences 4–5 tropical cyclones annually, including 1.5 hurricanes per year.

Mold After a Hurricane



If your home has been flooded by a hurricane or other natural disaster, excess moisture and standing water can lead to the growth of mold. Mold could be harmful to your family’s health, leading to a stuffy nose, sore throat, coughing, wheezing, burning eyes, or a skin rash. People with asthma, allergies, other breathing conditions, or immune suppression may be more sensitive to mold.

When returning to a home that has been flooded, clean up and dry out the space as quickly as possible (i.e., in 24-48 hours). Protect yourself while cleaning by using gloves, a [NIOSH-approved N95 mask](#), and goggles. Keep people with weakened immune systems and children away from the clean-up. Scrub surfaces with water and detergent, taking care not to mix cleaners. Toss anything that cannot be cleaned and dried, taking photos of discarded items for filing insurance claims. Open doors and windows, and when electricity is safe to use, use fans and dehumidifiers to remove moisture.

The Centers for Disease Control and Prevention (CDC) provides additional guidance at [Reentering Your Flooded Home](#) and [Homeowner’s and Renter’s Guide to Mold Cleanup After Disasters](#).

Hurricanes Affect Health in Many Ways

Hurricanes increase the risk for a diverse range of health outcomes. For example:

-  Flood water poses **drowning risks** for everyone, including those driving in flood waters. Storm surge historically is the leading cause of hurricane-related deaths in the United States.
-  Using generators improperly can cause carbon monoxide (CO) exposure, which can lead to **loss of consciousness** and **death**. Over 400 people die each year from accidental CO poisoning.
-  Winds can blow debris—like pieces of broken glass and other objects—at high speeds. Flying debris is the most common cause of **injury** during a hurricane.
-  Post-flooding mold presents risks for people with **asthma, allergies, or other breathing conditions**.
-  Open wounds and rashes **exposed to flood waters** can become infected.
-  Power failure during or after hurricanes can **harm patients** who critically depend on electricity-dependent medical equipment.

Which parts of the country are at high risk from hurricanes?

The Federal Emergency Management Agency (FEMA) provides information on the risk of different climate hazards across the 50 states and Washington, D.C., through the National Risk Index (NRI) platform. The Risk Index leverages available data for natural hazard and community risk factors to develop a baseline relative risk measurement for each United States county and census tract.

318 counties across **20 states and D.C.** are estimated to have “very high,” “relatively high,” or “relatively moderate” hurricane risk. In these counties, the total population at risk is **100,504,829 people**.

Risk factors vary across the 318 counties identified by FEMA. Of these counties:

46 (14%) have a high number* of people aged 65 or over, living alone.

109 (34%) have a high number of people without health insurance.

62 (19%) have a high number of uninsured children.

11 (3%) have a high number of people living in rural areas.

225 (71%) have a high number of Black or African American persons.

81 (25%) have a high number of people with frequent mental distress.

109 (34%) have a high number of people living in poverty.

53 (17%) have a high number of people spending a large proportion of their income on home energy.

195 (61%) have a high number of people with severe housing cost burden.

187 (59%) have a high number of people with electricity-dependent medical equipment and enrolled in the HHS emPOWER program.

97 (31%) have a high number of people in mobile homes.

53 (17%) have a high number of people with one or more disabilities.

138 (43%) are identified as highly vulnerable by CDC’s Social Vulnerability Index.

*“A high number” indicates that these counties are in the top quartile for this indicator compared to other counties

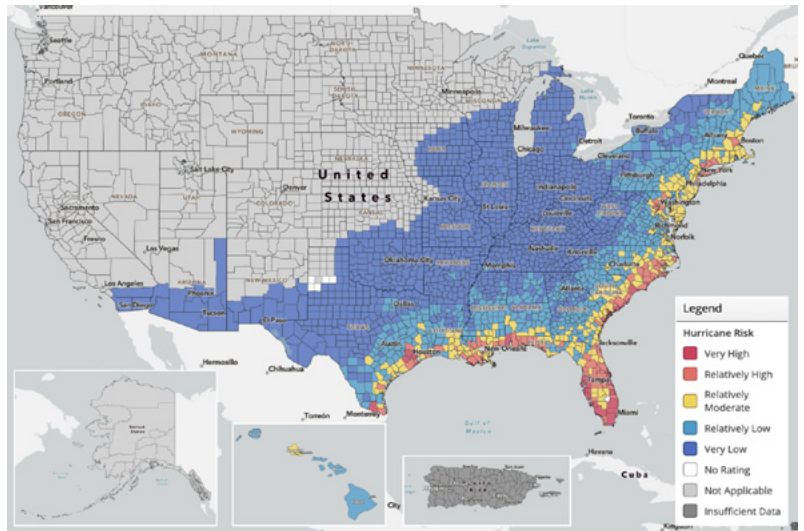


Figure: This map of the United States is colored by the National Risk Index rating for the Hurricane hazard. The characterization of risk across these counties are based on historical records on hurricane paths and intensity.

Resources to Reduce Health Risks Associated with Hurricanes

The Office of the Assistant Secretary for Preparedness and Response Technical Resources, Assistance Center, and Information Exchange’s (ASPR TRACIE’s) [Hurricane Resources at Your Fingertips](#), Centers for Disease Control and Prevention’s (CDC) [Hurricanes and Other Tropical Storms](#), Ready.gov [Hurricanes](#) site, and Ready Business [hurricane toolkit](#) include resources on hurricane preparedness for a variety of stakeholders and audiences.

The Substance Abuse and Mental Health Services Administration [Helpline and Text Service](#) is available 24/7, free, and staffed by trained crisis counselors. Call or text 1-800-985-5990 to get help and support for any distress that you or someone you care about may be feeling related to any disaster.

The U.S. Food and Drug Administration’s [Hurricanes: Health and Safety](#) site covers multiple topics to help consumers, industry stakeholders, and medical providers prepare for hurricanes. If you have Medicare and your medical device is damaged or lost due to an emergency or disaster, Medicare may cover the cost to [repair or replace your equipment or supplies](#).

The CDC has information on [preventing carbon monoxide poisoning](#) in case of a power outage. Generators should be used at least 20 feet away from your home.



[Image Source](#)

Locally Acquired Malaria Cases in the U.S.

For the first time since 2003, the U.S. has had locally acquired cases of malaria in Florida, Texas, and Maryland. Malaria is a serious mosquito-borne disease caused by different species of *Plasmodium* parasites that infect *Anopheles* species mosquitoes. People typically become infected with malaria following the bite of a mosquito carrying the parasite. While uncommon, malaria has been spread through blood transfusion and organ transplantation, by sharing needles or syringes, or from mother to baby during pregnancy or delivery.



Figure: *Anopheles* species mosquito. [Image Source](#)

There are about 2,000 reported cases of malaria in the U.S. each year, mostly in travelers returning from other countries. Continuous spread of malaria was eliminated in the U.S. in the early 1950s through mosquito surveillance and control measures; however, as we have seen this summer, locally acquired malaria cases do still occur in the U.S.

Anopheles species mosquitoes can be found in much of the continental U.S., making local spread possible if

people infected in a malaria-endemic country travel to the U.S. and are bitten by local *Anopheles* mosquitoes, which can then become infected and spread the parasite to people who have not traveled. The risk for local transmission is higher in areas where local climatic conditions allow *Anopheles* mosquitoes to survive during all or most of the year. Temperatures also need to be warm enough for the malaria parasite to develop in the mosquito. This summer, the U.S. has had plenty of the hot and humid conditions in which mosquitoes thrive, as well as increased international travel, potentially contributing to local spread.

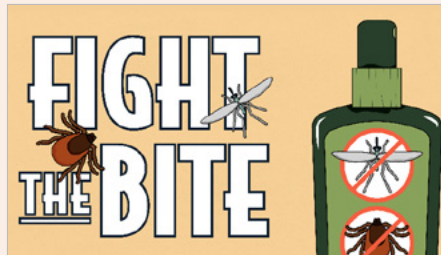
While local malaria transmission in the U.S. is rare, it is possible that increased temperatures and altered precipitation patterns and humidity due to climate change may lead to increased mosquito populations, increased range of *Anopheles* mosquitoes, a greater number of mosquito biting days, and faster development of the malaria parasite in mosquitoes, all of which could impact local transmission in the U.S. in the future.

The best way to prevent any mosquito-borne disease, including malaria, is to [protect yourself from mosquito bites](#). When outside, use an [Environmental Protection Agency-registered insect repellent](#) containing one of the following active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus, para-methanediol, or 2-undecanone, and [follow these tips for applying insect repellent on children](#) from the American Academy of Pediatrics; and/or wear loose-fitting, long-sleeved shirts and pants. Additionally, if you are traveling to a malaria-endemic country, check out [CDC's malaria prevention recommendations](#).

Resources to Reduce Health Risks Associated with Mosquito-Borne Diseases



The CDC [Malaria site](#) has information on malaria transmission, prevention, and common symptoms.



The CDC [Fight the Bite site](#) has information on preventing bites from both ticks and mosquitoes.

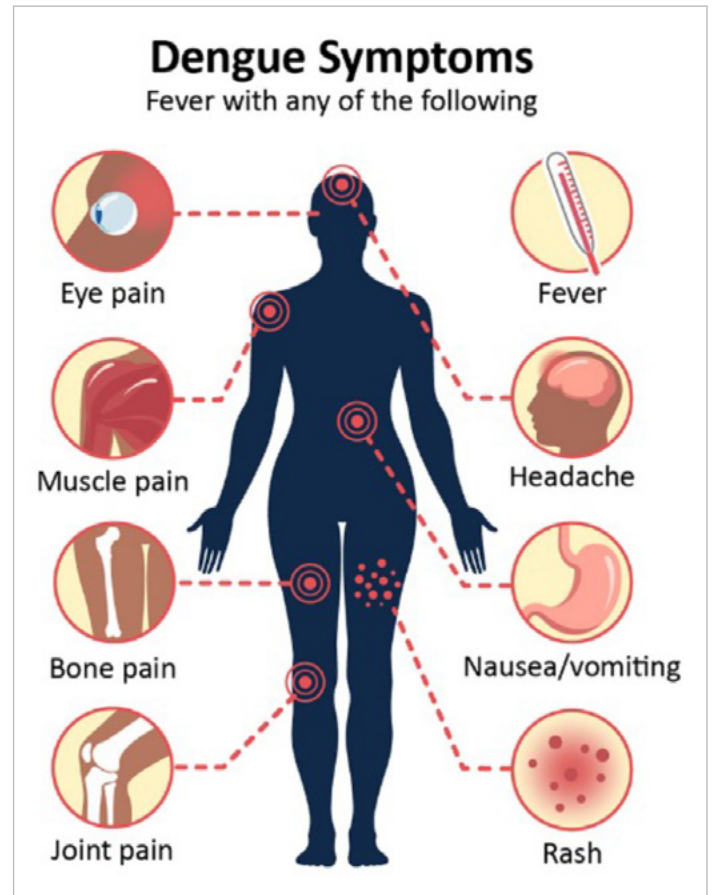


The CDC [Mosquito Control site](#) has information on taking steps to control mosquitoes both indoors and outdoors.

Dengue

Dengue viruses are spread to people through bites of infected *Aedes* species mosquitoes (*Ae. aegypti* or *Ae. albopictus*). There are an estimated 400 million dengue infections each year, but only about 25% of people infected with dengue will get sick. Symptoms typically include fever with aches and pains, nausea and vomiting, or rash. Less than 5% of dengue infections will progress to severe disease, which can lead to hospitalization and death. Early diagnosis and supportive medical care are essential in cases of severe dengue, which can be life-threatening within a few hours. There are currently no medications available to treat dengue.

Figure: Common symptoms of dengue. [Image Source](#)



Dengue Distribution

Dengue viruses are common in most tropical and sub-tropical regions of the world, which experience year-round transmission with seasonal and intermittent major epidemics. *Aedes* mosquitoes have hitchhiked to most of the warm and wet areas of the world where people live. This includes many parts of the U.S., some of which have endemic dengue, including American Samoa, Puerto Rico, the U.S. Virgin Islands, and the freely associated states. In Puerto Rico, there were almost 30,000 confirmed cases reported between 2010 and 2020.

Occasional dengue outbreaks can occur in non-endemic areas of the U.S. where *Aedes* mosquitoes live, but these outbreaks are rare. Outbreaks can happen when an infected traveler comes home and gets bitten by an *Aedes* mosquito. The mosquito gets infected and then bites healthy people, which can lead to an outbreak. *Aedes* mosquitoes require warm and humid environments for survival and reproduction, yet eggs can survive for up to 8 months in cold and dry conditions.

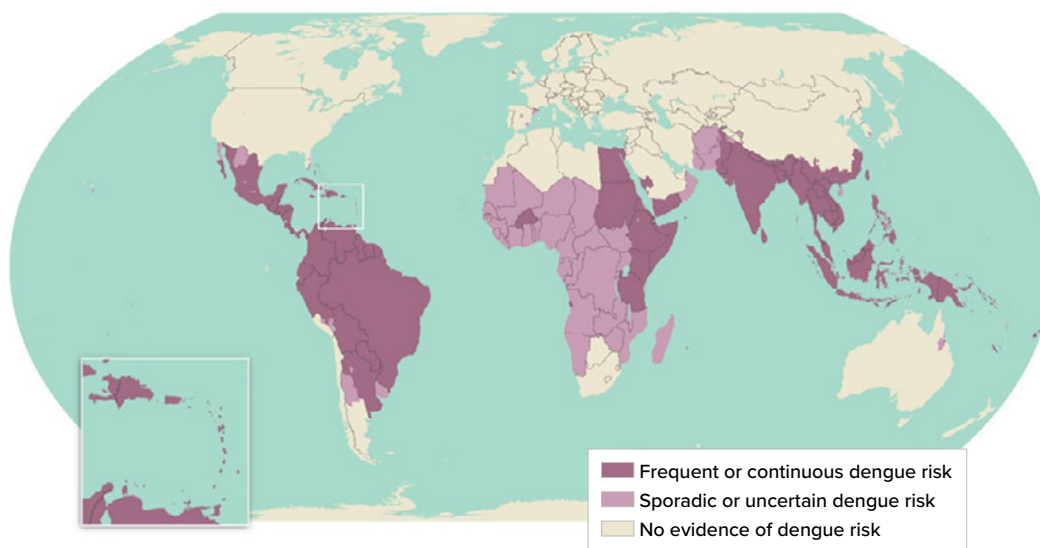


Figure: Map of areas with dengue risk, including frequent or continuous risk, sporadic or uncertain risk, and no evidence of dengue risk. [Image Source](#)

This allows the species to persist through dry periods and winters in many parts of the continental U.S. and other temperate regions of the world. Recent local dengue transmission in the continental U.S. has occurred in Florida, Texas, and Arizona, but most dengue cases reported in the continental U.S. occur in travelers infected elsewhere. In 2019, there were 1,474 travel-associated cases reported in the U.S., but the true annual number of infected travelers is likely many times higher.

Climate Change and Dengue

The impact of climate change on dengue is complex since many factors play a role in dengue transmission. *Aedes* species mosquitoes require warm temperatures for virus transmission, with optimal transmission estimated to occur at 77–86°F (25–30°C). Mosquitoes can alter their behavior to mitigate adverse environmental exposures, such as resting in shaded areas when temperatures are too high. The global increase in temperatures seems like a recipe for increased dengue due to better conditions for virus transmission.

Temperature is only one aspect of climatic suitability for *Aedes* mosquitoes. Extreme weather events that are increasing with climate change, such as floods and hurricanes, can also impact mosquito populations and dengue virus transmission. It is common for mosquito populations to decrease during and immediately after a hurricane, and then grow rapidly. Water accumulation is critical for immature mosquito development, and humidity is important for adult survival.

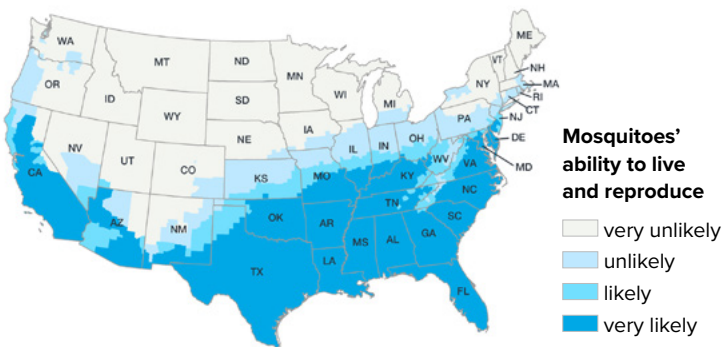
However, advances in infrastructure, like improved housing, water, and sanitation services, have helped to make dengue transmission rare in the continental U.S. These advances may help to prevent the spread of dengue, even as climate change makes environmental conditions more favorable for transmission.

Prevention

Mosquito control methods, such as trapping adult mosquitoes; using insecticides and larvicides; and removing standing water from places where mosquitoes lay eggs, such as buckets, planters, or bird baths; all help to stop the spread of dengue. Additionally, improved sanitation services, such as garbage collection and sewage systems, can decrease mosquito breeding sites. You can also prevent mosquitoes from getting into your home by installing screens on windows and doors and using air conditioning when available.

People living in or traveling to areas with higher risk of dengue should take steps to [prevent mosquito bites](#). When outside, use an [Environmental Protection Agency-registered insect repellent](#) containing one of the following active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus, para-methanediol, or 2-undecanone, and follow these [tips for applying insect repellent on children](#) from the American Academy of Pediatrics; and/or wear loose-fitting, long-sleeved shirts and pants. Additionally, children aged 9–16 years with laboratory-confirmed previous dengue virus infection and living in areas where dengue is endemic should get [vaccinated for dengue](#).

Estimated Potential range of *Aedes aegypti* in the United States, 2017



Estimated Potential range of *Aedes albopictus* in the United States, 2017



Figure: Maps showing the potential range of *Aedes aegypti* and *Aedes albopictus* in the U.S. as of 2017. These maps represent the CDC's best estimate of the potential range of *Aedes* species mosquitoes in the U.S., but do not represent risk for spread of disease. [Image Source](#)

THANK YOU to the partners who provide invaluable information, expertise, and data for the Climate and Health Outlook series:

